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Why Fat Interface Characters Are Better e-Health Advisors

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Abstract. In an experimental setting, we investigated whether body shape similarity between user and interface character affected involvement with, distance towards, as well as intentions to use the character in an e-health context. Users interacted with an interface character with the same (similar) or with a different (dissimilar) body shape as their own. Furthermore, the character's body shape was negatively valenced (heavier than ideal) or positively valenced (same as ideal). In contrast to what one might expect from stereotype research, users perceived non-ideal (fatter) characters as more credible and trustworthy than ideal (slim) characters. Especially users similar in body shape to a non-ideal character felt the least distant towards fatter characters. These users also preferred to *use* relatively fat characters over slim characters. Considering the increasing amount of overweight people in society, it seems most effective to design interface characters with bodies fatter than in current e-health applications, which often feature slim characters.

1 Introduction

Media such as the Internet can be used as powerful tools for health promotion and disease prevention [1; 2]. Interface characters may help to achieve these goals. Interface characters may significantly improve health care systems [3] by enriching the interfaces of e-health systems, and boost the use of such systems. A reason might be that they are likely to elicit social responses [cf. 4], such as trust, believability and involvement, especially when they display emotional communicative behaviors [5; 6; 7]. Some argue that users may even have the illusion of interacting with a human trainer or advisor, rather than just a tool [e.g., 8]. Indeed, research has shown that interface characters can be used effectively as virtual exercise trainers [5; 6], or diet advisors [8]. Hence, it is important to understand what factors contribute to involvement with and the willingness to use such characters in an e-health system.

In the present study, we are particularly interested in the effects of *similarity* between user and interface character on involvement and intentions to use the interface character system in an e-health context. In real life, similar others are often preferred over dissimilar others [9; 10; 11]. Apparently, people feel attracted to or comfortable with the similarity they perceive in others, which supports involvement. Hence, similarity is a core concept in involvement theory. Research has shown that people may compare themselves to interface characters as well, on dimensions such as gender [12; 13], face [14], ethnicity [15], and personality [16]. The overall pattern in these studies was that people preferred and had more positive attitudes towards interface characters that were

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similar to themselves. Similarity attracts. Users of e-health interface character systems may thus perceive similarities between their own bodies and those on screen, which may alter their involvement with and intentions to use the interface character system.

Although previous research suggests that similarity attracts, the effects of similarity are likely to be more complex. Research in interpersonal communication has shown that when similarity is paired with negative characteristics, such as unattractiveness or evidence of mental disturbance, people do *not* prefer similar, but dissimilar others [e.g., 16; 17]. Similarity to the *ideal* self is not only an important predictor of liking, but sometimes even more important than similarity to the current self [18; 19; 10]. This refers to 'wish identification' and 'role modeling' [cf. 1]. Although similarity to the ideal self seems influential, it is a relatively untouched research object in an interface character context [an exception is the work of Dryer, 16]. Therefore, this study addresses not only similarity to the current self, but also similarity to the ideal self. In the following sections, we will describe how the present study looks into the effects of ideal and non-ideal, similar and dissimilar interface characters in an e-health context.

2 Our Study

The comparison dimensions we focus on in our study is *body shape*, as this dimension allows us to study not only similarity effects but also the effects of ideal and non-ideal features. We refer to ideal body shapes as *positively valenced* body shapes and non-ideal body shapes as *negatively valenced* body shapes [cf. Frijda, 20].

In Western society, body shapes that are slim are perceived as ideal, that is, they are positively valenced. Slim and slender figures are consistently rated as more beautiful than heavier ones and are overrepresented in the media. In addition, fat people are generally attributed more negative characteristics such as laziness, sloppiness, and stupidity than slim people [e.g., 21]. The slim body ideal stirs the desirability of attaining a slim figure, which is especially true amongst women [22]. At present, 40 percent of the adult population in the Netherlands is overweight and 10 percent obese [23]. For children and adolescents, the situation is alarming as well: the percentage of overweight children doubled since the 1980's and accounts for approximately 12 percent [23]. All in all, we can conclude society is fattening up. Because of the current slim body ideal, fat people may perceive their body shape as non-ideal, or negatively valenced. In contrast, slim users may perceive their body shape as ideal, or positively valenced. Our study will provide an answer to the question whether fat users respond differently to equally fat interface characters (similar but negatively valenced) than to thin interface characters (dissimilar, but positively valenced). And, whether slim users respond differently to equally slim interface characters (similar and positively valenced) than to fat interface characters (dissimilar and negatively valenced). This may affect how interface characters should be designed as virtual exercise trainers or health advisors.

Based on the similarity-attracts paradigm, fat users are expected to be more involved with a fat interface character than with a thin interface character. However, when a fat user interacts with a fat interface character, the user may not simply be affected by body shape similarity. The similar feature may be perceived of as negative, or non-ideal, which may interfere with the similarity effect. In other words, when similarity is nega-

tively valenced, it may not increase but decrease involvement. Furthermore, when a fat user interacts with a slim interface character, more involvement may be evoked, as the slim body shape is perceived of as an ideal, positive feature of dissimilarity (cf. wish identification). In other words, when dissimilarity is positively valenced, it may not decrease but increase involvement. Indeed, in another context Novak and Lemer [17] found that positively valenced dissimilarity may be preferred over negatively valenced similarity.

Furthermore, Taylor and Mettee [cf. 24] found that similar others are evaluated more positively in case of a positive (personality) feature than dissimilar others having the same (personality) feature. Hence, ideal similar others are preferred over ideal dissimilar others. In addition, similar others are evaluated more negatively in case of a negative (personality) feature than dissimilar others having the same (personality) feature. Hence, non-ideal similar others are disfavored over non-ideal dissimilar others. In sum, ideal similar others were preferred over ideal dissimilar others, and non-ideal similar others were disfavored over non-ideal dissimilar others. Thus, the valence of a feature (negative/positive) seems to interact with similarity in explaining liking. Previous research has shown that involvement with and liking a character are highly related [25; 26]. Therefore, in line with the results of Taylor and Mettee, we hypothesize that similarity and valence interact in explaining user involvement with an interface character, as depicted in Figure 1. Our hypothesis runs as follows:

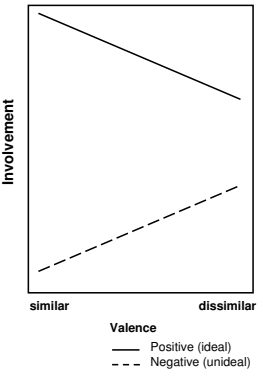

Fig. 1. Hypothesized (interaction) effects of similarity and valence on user involvement with an interface character

> **Hypothesis 1.** Similarity and valence interact in explaining user involvement. People are more involved with positively valenced similar others, than with positively valenced dissimilar others. People are less involved with negatively valenced similar others, than with negatively valenced dissimilar others.

Because the *use* of technology is an important end-goal in human-computer interaction, we also study the effects of similarity on intentions to use the interface character, expanding on existing similarity research which mostly focused on the effects of (dis)similarity on attraction and liking. Traditional human-computer interaction literature argues that system use mainly depends on the usefulness and usability of the system [27]. More recent literature, however, suggests that the appearance of a system also affects system use [e.g., 28]. Whether similarity between user and interface character affects system use, resembling interpersonal communication, is unclear and, to our knowledge, not yet studied. Do fat users prefer to use slim virtual trainers, for example, because the slim body of the trainer motivates them to lose weight, or do they prefer to use equally fat virtual trainers, with whom they can identify? Therefore, we pose the following research questions:

Research questions. 1. Does similarity between a user and an interface character affect the user's intentions to use the interface character? 2. Does valence (positive or negative features) affect intentions to use the interface character? And, 3. which is the best predictor of use intentions?

Important to the present study is also that involvement and use intentions may be moderated by several other user perceptions [26; 29]. Users do not only perceive (dis)similarity, but they also perceive characters in terms of aesthetics (e.g., is the character attractive), ethics (e.g., is the character trustworthy and credible), realism (e.g., is the character fantasy-like or realistic) and affordances (e.g., is the character skillful). Such perceptions may be related to similarity. For example, users may perceive a similar character as more beautiful than a dissimilar character, especially when the dissimilar character is negatively valenced (e.g., fat). Similarity may thus boost aesthetic judgments, hence altering the level of involvement. In addition, stereotype research suggests a greater activation of negative traits upon exposure to fat than upon exposure to thin characters [cf. 'what is beautiful is good', 30], especially female ones [e.g., 31]. As a range of perceptions may influence users' involvement with and intentions to use an interface character, it is insightful to study them in coalition with similarity effects.

3 Method

3.1 Participants and Design

Participants in our experiment were 80 university students (24 males and 56 females; mean age = 23, *SD* = 7.8), with body mass index ratings (mean = 22 kg/m^2, *SD* = 3.8) categorized as normal according to the classification of the World Health Organization. They were paid 2.50 Euro for their participation.

A 2 (similarity: similar versus dissimilar) x 2 (valence: positive versus negative) factorial design was used to test our hypotheses (see Table 1). Assignment of participants to experimental conditions was slightly unbalanced because the 'similar and ideal' condition was created after data-collection. This condition existed of those participants that had indicated the *same* figure to represent their current and ideal body shape (see section 3.2).

Table 1. Similarity and valence conditions in the experiment

	Similar to current self	**Dissimilar to current self**
Positively valenced feature	similar and ideal (n = 17)	dissimilar but ideal (n = 14)
Negatively valenced feature	similar but non-ideal (n = 18)	dissimilar and non-ideal (n = 27)

Note 1. Positively valenced = ideal; Negatively valenced = non-ideal

The first dependent variable was user involvement. The second dependent variable was user distance. Involvement and distance are distinct experiences that do not comprise two ends of a single dimension; both can be experienced at the same time [25; 26; 32]. The third dependent variable was intentions to use the interface character. Last,

we measured perceived aesthetics, realism, ethics, and affordances to study the effects of similarity and valence on these perceptions, and their effects on the dependents (see section 3.4).

3.2 Materials

An online, colored, and modernized version of the Figural Rating Scale [33, see Figure 2][1] was used to measure current, ideal, and non-ideal body shapes. Male participants were shown the male version (upper row) and female participants were shown the female version (lower row). The Figural Rating Scale is considered to be a reliable measure that is highly related to the Body Mass Index [33; 34; 35].

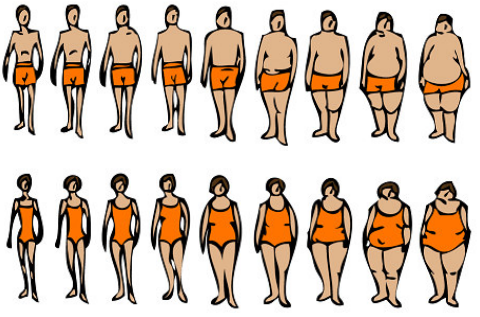

Fig. 2. Modernized version of the Figural Rating Scale

One of these figures was used as the interface character with which the participant would interact in the e-health context (see section 3.3). Both the interface character and the participant always had the same gender, as gender may influence similarity perceptions [e.g., 12; 13]. The interface character was called René (male) or Renée (female) and was positioned centrally on the screen and enlarged to occupy a large part of the computer screen (see Figure 3). René(e) had four different poses and the text was positioned right next to him/her.

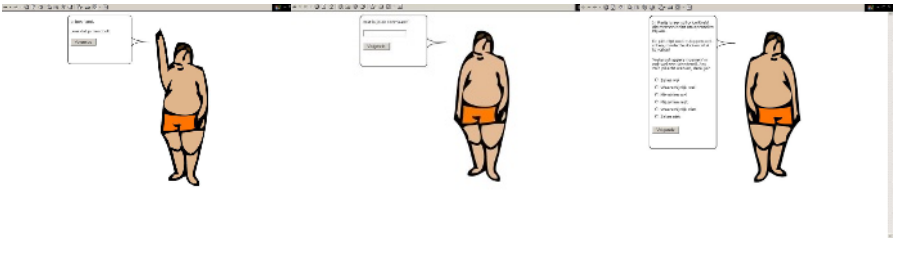

Fig. 3. Screenshots of the René(e) software

3.3 Procedure

Participants were seated individually, in front of a computer in one of the cubicles in a research lab at the Free University in Amsterdam. The participants were welcomed by the computer and told that their data would be processed anonymously. Then, they were asked to enter their gender, age, weight, and length. After that, they were asked to rate

[1] Reprinted from [33] with permission.

their current-self (what figure do you look like best), their ideal-self (what figure do you want to look like), and their non-ideal-self (what figure do you not want to look like) on three Figural Rating Scales. These were subsequently asked on separate Web pages, ordered randomly to prevent order effects. Each time, participants had to push on the 'next' button to proceed to the next question. The computer did not allow unanswered questions.

Then, an interface character appeared on the screen. Approximately 1/3 of the participants saw an interface character that was equal to their current-self, 1/3 to their ideal self, and 1/3 to their non-ideal self. At the first page, the interface character asked for the participant's name, then introduced itself as either René (male) or Renée (female), and welcomed the participant. In the following pages, personal information was gathered and René(e) asked participants their opinion or knowledge on several health-related issues using closed-answered questions, sometimes preceded by small introductory texts For example, 'Three quarters of the Internet users, about 9 million people, search for information on health issues on the Internet. Do you search the Internet for health information?', or, 'How important is your health to you?'. At the end, René(e) told that 'Soon, you can ask me questions on the Internet about a healthy lifestyle! For example, do you eat healthy?' We used questions, as opposed to solely plain text, to ensure a relatively lively interaction between interface character and participant, and to get more insight into their (un)healthy behaviors (these results will be addressed elsewhere). After the interaction, that took about 6 minutes, the participant was asked to complete the user perception questionnaire, presented on several subsequent Web pages. After completing the questionnaire, participants were debriefed and dismissed.

3.4 Measurements

All measurements were taken by means of a questionnaire containing Likert-type scales. Each item was followed by a 6 point rating scale, ranging from 1 (do not agree at all), 2 (do not agree), 3 (barely agree), 4 (agree a little), 5 (agree), to 6 (fully agree). Items were presented in random order. For the present study, we used shortened versions of reliable scales used in previous experiments [26; 29]. Where necessary, items were adjusted to the purpose of the present study, the specific material, and the language use of the target group of participants (university students).

Reliability analyses (N = 80) were performed on each set of items concerning separate scales. Selection criteria were 1) an optimal contribution to Cronbach's alpha by showing little or no increase in the alpha level when the item was deleted, 2) a minimal inter-item correlation of .30, and 3) a minimum of 2 items per scale. Further, we checked whether items were normally distributed. Items that failed on one or more of these criteria were not included in the measurement scales used in subsequent analyses.

Similarity. We checked for the similarity manipulations by means of a *perceived similarity* scale. Tversky [36] showed that similarity is psychologically asymmetrical, which means that similarity ratings may depend on the referent. If the interface character is used as referent (I look like René) similarity ratings may be different than when the participant is used as referent (René looks like me). Therefore, our perceived similarity

scale used items with different referents.[2] To avoid directing the participant in an affirmative answering mode [see 37], half of the similarity items were indicative and the other half counter-indicative (reverse-coded). The scale was reliable with a Cronbach's alpha of .93.

Valence. We also measured to what extent René(e) looked like the participant's *ideal* or not, using 2 items ('Do you want to look like me?'; 'Do you want to look differently than me?'). These *valence* items correlated significantly ($r = .68$).

Dependent measures. Involvement and distance were measured using 3 items each, based on [25]: Involvement ('Do you feel good about me?'; 'Do you feel involved with me'; 'Do you think it is pleasant to deal with me?', Cronbach's alpha = .72) and Distance ('Do you feel negatively about me?'; 'Do you feel distance between us?'; 'Do you think it is annoying to deal with me?'. Cronbach's alpha = .81). Use Intention, based on [26], was measured using 2 indicative ('Do you want to see me more often on the Internet?'; 'Do you want more information from me in the future?') and 3 counter-indicative ('Do you want to get rid of me'; 'Would you rather avoid me?'; 'Would you rather remove me from the screen?') items, Cronbach's alpha = .88.

Additional measures. In addition, we measured several other user perceptions[3]: perceived aesthetics (2 items, $r = .71$), perceived realism (2 items, $r = .64$), perceived affordances (5 items, Cronbach's alpha = .70), and perceived ethics (3 items, 1 item was left out of the scale because Cronbach's alpha increased substantially when the item was deleted. The remaining items, concerning trustworthiness and credibility, correlated significantly with $r = .62$). Finally, questions asked for personal information about the participants: the participant's gender, age, weight, length, computer experience, ethnicity, education, and body shape satisfaction.

4 Results

Preliminary analyses. For each item, outliers were replaced by the mean of the remaining values. Further, four participants had outliers on five or more items of various scales. These participants were regarded as unreliable and were disregarded in subsequent analyses.

We assessed the effectiveness of our manipulations of similarity (similar versus dissimilar body shape) and valence (ideal versus non-ideal body shape) by performing a MANOVA with perceived similarity and perceived valence as dependents. The tests of between-subject effects revealed a significant effect of the similarity conditions on similarity perceptions in accordance with our intentions ($F(1, 72) = 14.15$; $p < .001$, partial $\eta^2 = .16$; similar to current body shape $M = 3.1$, $SD = .87$; dissimilar to current body shape $M = 2.2$, $SD = .96$). Furthermore, there was a significant effect of the valence conditions on valence perceptions (ideal-non-ideal) into the right direction ($F(1, 72) = 18.79$, $p < .001$, partial $\eta^2 = .21$; ideal body shape $M = 3.2$, $SD = .89$; non-ideal body shape $M = 2.2$, $SD = 1.0$). These effects thus supported our manipulation aims.

[2] In the first set of items, the participant was the referent (e.g., 'Do you think I am like you?'). In the second set, the interface character was the referent (e.g., 'Do you think you are like me?'). In the third set, there was no explicit referent (e.g., 'Do you think we resemble each other?').

[3] Only scales relevant to the present paper are presented.

Table 2. The effects of similarity, valence, perceived aesthetics, ethics, realism, and affordances on involvement, distance and use intentions

Source	*Dependents*	*df*	*F*	*partial* η^2	*p*
Main effects					
Similarity (Between-Ss factor)	multivariate	(3,58)	.54	.03	.659
Valence (Between-Ss factor)	multivariate	(3,58)	.32	.02	.809
Affordances	multivariate	(3,58)	.60	.03	.621
Aesthetics	multivariate	(3,58)	1.47	.07	.232
Ethics	multivariate	(3,58)	4.30	.18	.008*
	involvement	(1, 60)	10.45	.15	.002*
	distance	(1, 60)	2.90	.05	.094
	use intentions	(1, 60)	8.47	.12	.005*
Realism	multivariate	(3,58)	2.45	.11	.073
	involvement	(1, 60)	4.80	.07	.032*
	distance	(1, 60)	5.52	.08	.022*
	use intentions	(1, 60)	2.05	.03	.157
2-way interactions					
Similarity*Ethics	multivariate	(3,58)	3.22	.14	.029*
	involvement	(1, 60)	1.09	.02	.301
	distance	(1, 60)	9.46	.14	.003*
	use intentions	(1, 60)	5.08	.08	.028*
Valence*Ethics	multivariate	(3,58)	2.80	.13	.048*
	involvement	(1, 60)	.74	.01	.394
	distance	(1, 60)	4.29	.07	.043*
	use intentions	(1, 60)	2.66	.04	.108

Note 2. A MANOVA was performed that revealed both multivariate and univariate effects. Only if the multivariate test showed (marginally) significant results (indicated by *), the univariate effects are given to distinguish between effects on involvement, distance, and use intentions. In addition, only those 2-way interaction effects are shown that were significant.

Main analyses. To test the hypothesis and inspect the research question, a MANOVA was conducted with similarity (similar versus dissimilar) and valence (positive versus negative) as the between-subject factors. The dependent variables were use intentions, involvement, and distance. In addition, perceived aesthetics, ethics, realism and affordances were included as covariates. The multivariate test showed no main effects of the factor similarity and valence, nor of perceived affordances and aesthetics on the dependents (see Table 2). Yet, a main effect was found of perceived ethics and perceived realism on the dependents. In addition, 2-way interaction effects were found of similarity and ethics, and of valence and ethics on the dependents.

Univariate tests confirmed the obtained multivariate results. More specifically, we found a significant main effect of perceived realism on involvement and distance. The more participants perceived the interface character as realistic, the more involvement and the less distance was evoked. In addition, univariate tests showed a significant effect of perceived ethics on involvement and use intentions. The more participants perceived the interface character as ethically good (that is, trustworthy and credible) the more they felt involved with the character, and the more they wanted to use the character.

Furthermore, the 2-way interaction effects showed that the influence of perceived ethics on distance and on use intentions (see Figure 4) was *stronger* for similar than for dissimilar characters. Low perceptions of ethics evoked more distance in the similar than in the dissimilar condition. High perceptions of ethics evoked less distance in the similar than in the dissimilar condition. In addition, the influence of perceived ethics on involvement was stronger for negatively valenced (fat) than positively valenced (slim) characters. In general, low perceptions of ethics evoked more distance in the negatively valenced than in the positively valenced condition. High perceptions of ethics evoked less distance in the negatively valenced than in the positively valenced condition.

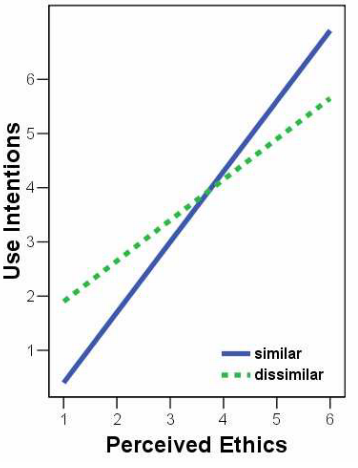

Fig. 4. The effect of perceived ethics on use intentions in the similar and dissimilar conditions

Further analyses showed that negatively valenced (fat) characters were perceived as more realistic than positively valenced (slim) characters (negative: M = 3.9, SD = 1.2; positive: M = 3.3, SD = .95; F(1,76) = 4.48, p <.038, partial η^2 = .06). They were also perceived as ethically better than positively valenced characters (negative: M = 3.7, SD = .89); positive: M = 3.2, SD = .77; F(1,76) = 5.44, p <.023, partial η^2 = .07).

5 Conclusion and Discussion

The expected effects of similarity and valence on user responses remained absent. Interestingly, however, perceived ethics (trustworthiness and credibility) was most decisive for user responses. Negatively valenced (fat) interface characters were perceived of as *better* (trustworthy and credible) and more realistic than the positively valenced (slim) interface characters, even though slim interface characters were perceived of as more 'ideal' in terms of body shape. As a result, users felt most involved with, and least distant to the fat characters. They also wanted to use these fat characters more than slim ones. Characters perceived as highly trustworthy and credible led to less distance and evoked stronger use intentions in users similar to the character than to users dissimilar to the character (and vice versa). Last, use intentions were strongest when users were similar in body shape to a non-ideal character.

Yet, an important target group of e-health systems is the increasing number of overweight people. In such systems, virtual health advisors often have an ideal thin body shape, probably set as an example as something to strive for. However, the results of the present study suggest that potential users of such e-health systems would be better off with more similar advisors in terms of their body shape, that is, fatter ones. The slim characters in the present study were perceived as less trustworthy and less credible. Therefore, the use of fatter characters will probably increase the trust that users have in

the interface characters. As a result, user distance towards the advisor will decrease and users will probably tend to use the advisor more often. This is precisely what e-health systems designers strive for. It should be noted, however, that the present study examined the *intention* to use the advisor but did not assess participant's actual efforts to use the character again. Although intentions to use and actual use are highly related [27], future research should also include measures of actual use.

The appearance of the interface character in terms of perceived realism further contributed to user's involvement and distance. That is, the more real the users perceived the character, the more users felt involved with the interface character, and the less users felt distant to the interface character. This is in line with the vast amount of literature that points at the advantages of realistic interface characters above unrealistic ones [e.g., 25]. However, that *fat* characters were perceived as more trustworthy and credible than slim characters is inconsistent with stereotype theory. Stereotype theory predicts that more negative traits are assigned to fat than to slim others [e.g., 21]. Apparently, stereotype theory does not hold in all contexts. In specific contexts, like in our study, specific features may counteract stereotype theory. For example, if relevant to a particular context (here health), people may attribute more positive traits (trust, credibility) to the anti-stereotype (here the fatter) interface character than to the stereotype (slim) interface character. Perhaps, users expect a better understanding for health problems from a fat than from a slim e-health advisor. You believe an advisor who tells you that being fat is no fun better when the advisor is fat himself - s/he knows what s/he is talking about. The slim, athletic gym instructor who jumps around telling you that being fat is no fun can be easily dismissed - what does s/he know?

Thus, the present study showed that trust in online health advice is influenced by the look and feel of the character on the Web site. In a similar vein, [38; 39] showed that visual Web site design affects user's trust, next to the quality of information, the branding of the site, the presence of trusted logos, and personalization of the advice to the individual. Persuasion studies [40] showed that both attractiveness, credibility and trustworthiness affect the persuasiveness of messages. The present study further suggests that in e-health advice systems, attractiveness is less important than credibility and trustworthiness (i.e. perceived ethics). This is consistent with previous research on media characters, in which perceived ethics was also the best predictor of engagement with the character [25].

There is a large variation in e-health Web sites, and online advice may take different forms [38]. Therefore, further studies should investigate to which extent the found effect may hold within various contexts. For example, we expect that trust will contribute to user responses (e.g., engagement, use intentions) in online advice systems (e.g., on health, travel, online transactions) and in different e-health systems [c.f. 38]. However, with respect to systems used for entertainment purposes, trust might be less important. Effects of similarity between interface character and user as well as effects of the attractiveness of the interface character might be more decisive for engagement [cf. 26] and/or use intentions in an entertainment context.

In our study, similarity merely raised null effects. Null findings might have many reasons. A plausible reason for the null effect of similarity might be that participants in our sample showed little variance in perceived similarity. Perceived similarity ratings

showed that participants felt more *dis*similar than similar in all conditions, although perceptions of similarity differed significantly between the conditions. Other research did find similarity effects on other dimensions such as facial similarity [e.g. 14] and personality similarity [e.g. 16]. As various studies show the complexity of user responses to interface characters [29; 26], it is of value in future similarity studies to measure a range of user perceptions regarding the interface character in order to better understand user responses to interface characters.

Finally, most participants in the present study had a normal to thin posture, and only a few were overweight whereas none were obese. In that sense, the sample was not a representative reflection of the Dutch society (counting approximately 40% overweight). In our next study, we plan to address more overweight participants by playing the online version of the René(e) software on a popular Web site with a more general audience. Participants will be drawn from the visitors of the Web site. We will then retest and refine our hypotheses. The results of future studies may reveal more unexpected implications for the design of persuasive interface character systems in the e-health domain, just like the present study did.

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